CLAIMS

What is claimed is:

1. A method comprising:

receiving an uplink signal from a first remote user terminal on a first carrier frequency at a first wireless communications base station together with ambient noise and interfering signals from at least one other remote user terminal on the first carrier frequency, the first carrier frequency being determined using a first hopping sequence used for communication with the first remote user terminal;

determining a set of receive spatial processing parameters for the first remote user terminal and the first carrier frequency using the received uplink signal, the received noise and the received interfering signals;

determining a second carrier frequency for use in communication with the first remote user terminal at a second time using the first hopping sequence;

comparing the second carrier frequency to a predicted carrier frequency that will be used by the at least one other remote user terminal at the second time; and

transmitting a downlink signal from the first base station to the first remote user terminal at the second time on the second carrier frequency using a set of transmit spatial processing parameters, the set of transmit spatial parameters being based on the set of receive spatial processing parameters if the second carrier frequency and the predicted carrier frequency are interfering carrier frequencies.

2. The method of Claim 1, wherein comparing comprises comparing the value of the first hopping sequence at the second time to the value of the second hopping sequence at the second time.

3. The method of Claim 2, wherein comparing the values comprises looking up the second hopping sequence in a database on the first base station.

4. The method of Claim 2, wherein comparing the values comprises looking up the second hopping sequence in a database on a central base station.

5. The method of Claim 2, wherein comparing comprises listening to the at least one other remote user terminal to predict the second hopping sequence.

6. The method of Claim 1, wherein the first hopping sequence and the second hopping sequence are the same and wherein the first remote user terminal and the at least one other remote user terminal apply the respective hopping sequences using a common timing signal.

7. The method of Claim 1, wherein the first time comprises a first time slot of a first TDMA frame and the second time comprises a second time slot of a second TDMA frame.

8. The method of Claim 1, wherein receiving an uplink signal precedes transmitting a downlink signal.

9. The method of Claim 1, wherein the set of transmit spatial processing parameters are selected to place nulls directed at the at least one other remote user terminal.

10. A method comprising:

determining whether a third radio using a first frequency resource during a first time interval uses a second frequency resource during a second time interval;

selecting a set of spatial processing parameters based, at least in part, on the determination; and

transmitting a signal from a first radio to a second radio during the second time interval using the second frequency resource and the selected set of spatial processing parameters.

11. The method of Claim 10, wherein selecting a set of spatial processing parameters comprises selecting a first set of spatial processing parameters if the third radio uses the second frequency resource during the second time interval, and selecting a second set of spatial processing parameters if the third radio does not use the second frequency resource during the second time interval.

12. The method of Claim 11, further comprising:

receiving a signal at the first radio from the second radio during the first time interval using the first frequency resource; and

calculating the first set of spatial processing parameters based, at least in part, on the received signal, prior to selecting the set of spatial processing parameters.

13. The method of Claim 12, further comprising receiving a second signal at the first radio from the third radio during the first time interval using the first frequency resource prior to calculating the first set of spatial processing parameters.

14. The method of Claim 13, wherein calculating comprises calculating the first set of spatial processing parameters based, at least in part, on the second received signal.

15. The method of Claim 13, further comprising a fourth radio in communication with the third radio and wherein the first and fourth radios are base stations and the second and third radios are remote user terminals in a wireless communications network.

16. The method of Claim 10, wherein determining comprises ascertaining whether, during the second time interval, a frequency resource determined from a first hopping function used by the third radio coincides with a frequency resource determined from a second hopping function used by the first radio.

17. The method of Claim 10, wherein the frequency resource used by the third radio in any time interval is controlled by a first hopping function, wherein the frequency resource used by the first radio to transmit to the second radio is controlled by a second hopping function and wherein determining comprises comparing the first and second hopping functions.

18. The method of Claim 17, wherein selecting a set of spatial processing parameters comprises selecting a first set of spatial processing parameters if the first and second hopping functions are the same and selecting a selecting a second set of spatial processing parameters if the first and second hopping functions are different.

19. The method of Claim 17, wherein comparing the first and second hopping functions comprises comparing the time synchronization of the first and second hopping functions.

20. The method of Claim 10, wherein transmitting from the first radio using the first set of spatial processing parameters comprises mitigating interference transmitted to the third radio.

21. The method of Claim 20, wherein transmitting from the first radio using the first set of spatial processing parameters comprises placing nulls in the direction of the third radio.

22. The method of Claim 10, wherein the first and second frequency resources each comprise a combination of a physical carrier frequency and a time slot assignment in a time division air interface protocol.

23. The method of Claim 22, wherein the air interface protocol comprises a protocol selected from the group comprising a GSM protocol, a CDMA protocol, a digital cellular protocol, a WLL protocol, and a PHS protocol.

24. The method of Claim 10, wherein the first time interval comprises a first time slot of a first TDMA frame and the second time interval comprises a second time slot of a second TDMA frame.

25. The method of Claim 24, wherein the first TDMA frame immediately precedes the second TDMA frame.

26. The method of Claim 10, further comprising receiving a second signal at the first radio from the second radio using the selected set of spatial processing parameters.

27. A machine-readable medium having stored thereon data representing instructions, which if executed by the machine, cause the machine to perform operations comprising:

determining whether a third radio using a first frequency resource during a first time interval uses a second frequency resource during a second time interval;

selecting a set of spatial processing parameters based, at least in part, on the determination; and

transmitting a signal from a first radio to a second radio during the second time interval using the second frequency resource and the selected set of spatial processing parameters.

28. The medium of Claim 27, wherein the instructions for selecting a set of spatial processing parameters comprise instructions causing the machine to perform operations comprising selecting a first set of spatial processing parameters if the third radio uses the second frequency resource during the second time interval, and selecting a second set of spatial processing parameters if the third radio does not use the second frequency resource during the second time interval.

29. The medium of Claim 28, comprising further instructions, which if executed by the machine, cause the machine to perform further operations comprising:

receiving a signal at the first radio from the second radio during the first time interval using the first frequency resource; and

calculating the first set of spatial processing parameters based, at least in part, on the received first receive signal, prior to selecting the set of spatial processing parameters.

30. The medium of Claim 28, wherein the instructions for calculating comprise further instructions causing the machine to perform operations comprising calculating the first set of spatial processing parameters based, at least in part, on the second receive signal.

31. The medium of Claim 27, wherein the frequency resource used by the third radio in any time interval is controlled by a first hopping function, wherein the frequency resource used by the first radio to transmit to the second radio is controlled by a second hopping function and wherein the instructions for determining comprise further

instructions causing the machine to perform operations comprising comparing the first and second hopping functions.

32. An apparatus comprising:

a processor to determine whether a third radio using a first frequency resource during a first time interval uses a second frequency resource during a second time interval and to select a set of spatial processing parameters based, at least in part, on the determination; and

a transmitter of a first radio to transmit a signal to a second radio during the second time interval using the second frequency resource and the selected set of spatial processing parameters.

33. The apparatus of Claim 32, wherein the processor selects a set of spatial processing parameters by selecting a first set of spatial processing parameters if the third radio uses the second frequency resource during the second time interval, and selecting a second set of spatial processing parameters if the third radio does not use the second frequency resource during the second time interval.

34. The apparatus of Claim 33, further comprising:

a receiver of the first radio to receive a signal from the second radio during the first time interval using the first frequency resource; and

wherein the processor calculates the first set of spatial processing parameters based, at least in part, on the received first receive signal, prior to selecting the set of spatial processing parameters.

35. The apparatus of Claim 34, wherein the receiver further receives a second signal at the first radio from the third radio during the first time interval using the first

frequency resource prior to the processor calculating the first set of spatial processing parameters.

36. The apparatus of Claim 35, wherein the processor calculates the first set of spatial processing parameters based, at least in part, on the second receive signal.

37. The apparatus of Claim 35, further comprising a fourth radio in communication with the third radio and wherein the first and fourth radios are base stations and the second and third radios are remote user terminals in a wireless communications network.

38. The apparatus of Claim 32, wherein the transmitter comprises a spatial division antenna array to mitigate interference transmitted to the third radio using the first set of spatial processing parameters.

39. A method comprising:

transmitting signals from a first radio using a first hopping sequence; and

transmitting signals from a second radio using spatial processing and a second hopping sequence, the second hopping sequence being coordinated with the first hopping sequence.

40. The method of Claim 39, wherein the first hopping sequence is the same as the second hopping sequence through at least 3 consecutive hops.

41. The method of Claim 39, wherein the first hopping sequence is the same as the second hopping sequence.

42. The method of Claim 39, wherein the first and second radios comprise first and second base stations in a wireless communications network, at least a portion of

the signals transmitted from the first base station interfering with at least a portion of the signals transmitted from the second base station.

43. The method of Claim 42, wherein the wireless communications network is a cellular network and wherein the first and second base stations are in adjacent cells.

44. The method of Claim 39, wherein the transmitted signals conform to an air interface protocol selected from the group comprising a GSM protocol, a CDMA protocol, a digital cellular protocol, a WLL protocol, and a PHS protocol.

45. The method of Claim 39, wherein the hopping sequence used by the first radio is time synchronized with the hopping sequence used by the second radio.

46. The method of Claim 39, further comprising adjusting the spatial processing parameters used for transmitting signals from the second radio when a frequency resource for use at a specific time as determined by the first hopping sequence does not coincide with a frequency resource for use at the same specific time as determined by the second hopping sequence.

47. The method of Claim 46, wherein adjusting comprises eliminating spatial processing parameters based on radio communications of the first radio.

48. The method of Claim 39, further comprising synchronizing the timing applied to the first and second hopping sequences.

49. The method of Claim 39, wherein synchronizing the timing comprises receiving a common satellite timing signal at the first radio and at the second radio and applying the timing signal to the hopping sequences.

50. The method of Claim 39, wherein the second hopping sequence is coordinated with the first hopping sequence in that the first hopping sequence is stored in

a memory of the second base station, the method further comprising comparing the first and second hopping sequences to select spatial processing parameters.

51. A machine-readable medium having stored thereon data representing instructions, which if executed by the machine, cause the machine to perform operations comprising:

transmitting signals from a first radio using a first hopping sequence; and

transmitting signals from a second radio using spatial processing and a second hopping sequence, the second hopping sequence being coordinated with the first hopping sequence.

52. The medium of Claim 51, wherein the first hopping sequence is the same as the second hopping sequence through at least 3 consecutive hops.

53. The medium of Claim 51, wherein the first hopping sequence is the same as the second hopping sequence.

54. The medium of Claim 51, wherein the first and second radios comprise first and second base stations in a wireless communications network, at least a portion of the signals transmitted from the first base station interfering with at least a portion of the signals transmitted from the second base station.

55. The medium of Claim 51, further comprising instructions, which if executed by the machine, cause the machine to perform further operations comprising synchronizing the timing of the hopping sequence used by the first radio with the hopping sequence used by the second radio.

56. The medium of Claim 51, further comprising instructions, which if executed by the machine, cause the machine to perform further operations comprising

adjusting the spatial processing parameters used for transmitting signals from the second radio when a frequency resource for use at a specific time as determined by the first hopping sequence does not coincide with a frequency resource for use at the same specific time as determined by the second hopping sequence.

57. The method of Claim 56, wherein adjusting comprises eliminating spatial processing parameters based on radio communications of the first radio.

58. The method of Claim 51, further comprising synchronizing the timing applied to the first and second hopping sequences.

59. The method of Claim 51, wherein synchronizing the timing comprises receiving a common satellite timing signal at the first radio and at the second radio and applying the timing signal to the hopping sequences.

60. The method of Claim 51, wherein the second hopping sequence is coordinated with the first hopping sequence in that the first hopping sequence is stored in a memory of the second base station, the method further comprising comparing the first and second hopping sequences to select spatial processing parameters.

61. An apparatus comprising:

a first radio having a first transmitter to transmit signals using a first hopping sequence; and

a second radio having a second transmitter to transmit signals using spatial processing and a second hopping sequence, the second hopping sequence being coordinated with the first hopping sequence.

62. The apparatus of Claim 61, wherein the first hopping sequence is the same as the second hopping sequence through at least 3 consecutive hops.

63. The apparatus of Claim 61, wherein the first hopping sequence is the same as the second hopping sequence.

64. The apparatus of Claim 61, wherein the first and second radios comprise first and second base stations in a wireless communications network, at least a portion of the signals transmitted from the first base station interfering with at least a portion of the signals transmitted from the second base station.

65. The apparatus of Claim 64, wherein the wireless communications network is a cellular network and wherein the first and second base stations are in adjacent cells.

66. The apparatus of Claim 61, wherein the transmitted signals conform to an air interface protocol selected from the group comprising a GSM protocol, a CDMA protocol, a digital cellular protocol, a WLL protocol, and a PHS protocol.

67. The apparatus of Claim 61, wherein the second radio comprises a synchronization subsystem to synchronize the timing of the hopping sequence used by the second radio with the hopping sequence used by the first radio.

68. The apparatus of Claim 67, wherein the synchronization subsystem comprises a satellite receiver to receive a common satellite timing signal at the second radio and apply the timing signal to the hopping sequences.

69. The apparatus of Claim 61, wherein the second radio further comprises a memory to store the first hopping sequence and the second hopping sequence and a processor to compare the first and second hopping sequences to select spatial processing parameters.